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भाग 2 किनारों एवं धारों की कमियाँ तथा अन्य सतहों की कमियाँ

Indian Standard

REFRACTORY PRODUCTS — MEASUREMENT OF DIMENSIONS AND EXTERNAL DEFECTS OF REFRACTORY BRICKS

PART 2 CORNER AND EDGE DEFECTS AND OTHER SURFACE IMPERFECTIONS

ICS 81.080

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

February 2013 **Price Group 4**

Refractories Sectional Committee, MTD 15

NATIONAL FOREWORD

This Indian Standard (Part 2) which is identical with ISO 12678-2 : 1996 ‘Refractory products — Measurement of dimensions and external defects of refractory bricks — Part 2: Corner and edge defects and other surface imperfections’, issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Refractories Sectional Committee and approval of the Metallurgical Engineering Division Council.

This standard is published in two parts. Other part in this series is:

Part 1 Dimensions and conformity to drawings

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words ‘International Standard’ appear, referring to this standard, they should be read as ‘Indian Standard’.

b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

c) In clause **10**, measurements of protrusions and indentations is given. Alternatively tongue and groves (protrusions and indentations) is also measured by means of a template which is geometrically identical with the dimensions in the product drawing.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their respective places are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 5019 : 1984 (All parts) Refractory bricks — Dimensions	IS 1526 : 1960 Sizes and shapes for firebricks	Technically Equivalent
	IS 5495 : 1969 Sizes and shapes for firebricks (300 mm and higher sizes)	
ISO 5417 : 1986 Refractory bricks for use in rotary kilns — Dimensions	IS 10607 : 1983 Refractories for cement rotary kilns	do

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

REFRACTORY PRODUCTS — MEASUREMENT OF DIMENSIONS AND EXTERNAL DEFECTS OF REFRACTORY BRICKS

PART 2 CORNER AND EDGE DEFECTS AND OTHER SURFACE IMPERFECTIONS

1 Scope

This part of ISO 12678 describes apparatus and specifies simple methods for routine measurement of corner and edge defects, as well as other surface imperfections of refractory bricks. It does not apply to the measurement of internal defects. It does not establish criteria for acceptance or rejection of bricks.

The application of these methods is limited to standard shapes in accordance with ISO 5019-1 to ISO 5019-6 and ISO 5417, unless otherwise agreed.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 12678. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 12678 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 5019-1:1984, *Refractory bricks — Dimensions — Part 1: Rectangular bricks.*

ISO 5019-2:1984, *Refractory bricks — Dimensions — Part 2: Arch bricks.*

ISO 5019-3:1984, *Refractory bricks — Dimensions — Part 3: Rectangular checker bricks for regenerative furnaces.*

ISO 5019-4:1988, *Refractory bricks — Dimensions — Part 4: Dome bricks for electric arc furnace roofs.*

ISO 5019-5:1984, *Refractory bricks — Dimensions — Part 5: Skewbacks.*

ISO 5019-6:1984, *Refractory bricks — Dimensions — Part 6: Basic bricks for oxygen steel-making converters.*

ISO 5417:1986, *Refractory bricks for use in rotary kilns — Dimensions.*

3 Definitions

For the purposes of this part of ISO 12678, the following definitions apply.

3.1 corner defect: Missing corner, defined by the three dimensions a, b and c as indicated in figure 1.

3.2 edge defect: Missing edge, defined by the three dimensions e, f and g as indicated in figure 2.

3.3 crater: Clearly defined hole in the surface of a brick whose parameters (maximum diameter, minimum diameter and depth) can be measured with the apparatus specified in clause 4.

3.4 Cracks, subdivided as follows:

3.4.1 hairline cracks: Fine cracks visible on the surface of a brick whose length may be measured and whose width is less than or equal to 0,2 mm.

3.4.2 surface crazing: Network of hairline cracks confined to the surface of the brick.

3.4.3 open cracks: Cracks or tears in the surface whose length is more than 10 mm and whose width is more than 0,2 mm.

NOTE 1 The above types of cracks may appear as indicated in figure 3, from left to right respectively.

3.5 protrusions and indentations: Imperfections that may occur during the moulding or firing process of bricks and blocks.

3.6 fins: Thin layer of material on a face of a brick that projects beyond the edge.

4 Apparatus

4.1 General

All instruments shall be calibrated or certified to within the accuracy of the measurement. The accuracy of the linear measuring device (4.2) shall be checked regularly against a length bar complying with national standards.

4.2 Linear measuring device (steel tape graduated in millimetres, calipers, graticule with 0,1 mm graduations), in accordance with the tolerance agreed upon, and conforming to an accuracy of half the intended accuracy of the measurement.

NOTE 2 Steel tape measurements are accurate to 1 mm (0,5 mm can be estimated), whereas caliper measurements are accurate to 0,1 mm. Linear tolerances less than 1 mm should be measured with calipers.

4.3 Steel straightedge, at least 5 mm thick and of sufficient length to span the diagonal of the largest shape to be measured.

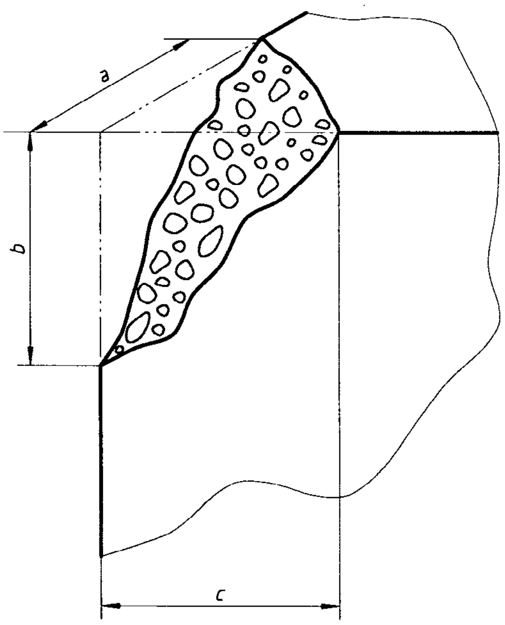


Figure 1 — Typical corner defect

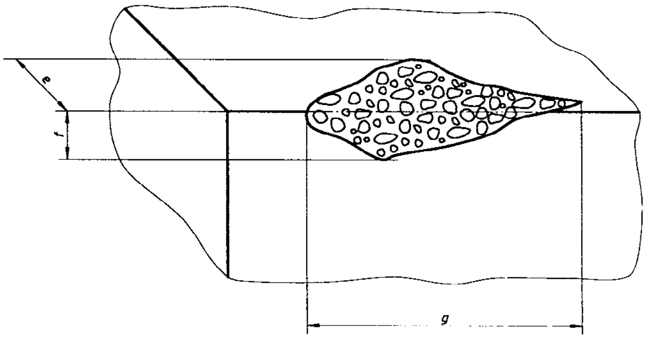


Figure 2 — Typical edge defect

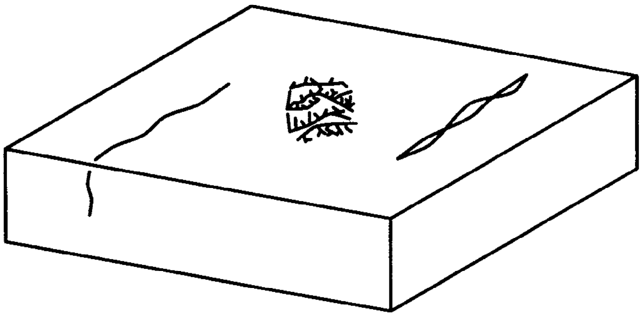


Figure 3 — Typical cracks

4.4 Two steel measuring wedges, which may be either:

a) Type 1, at least 50 mm in length and 10 mm in thickness at one end, of uniform cross-section for a length of at least 10 mm from that end and then tapering to zero thickness at the other end [see, for example, figure 4 a)]; or

b) Type 2, up to 160 mm in length with an even taper from 4 mm to zero [see, for example, figure 4 b)].

Each wedge shall be graduated and numbered along the slope to show the thicknesses of the wedge between the base and the slope, in increments of either 0,5 mm (Type 1) or 0,1 mm (Type 2).

The wedges shall be used, together with the steel straightedge, for the determination of the height of protrusions (see clause 10)

4.5 Feeler gauges, to be used for the measurement of crack width.

4.6 Depth gauge, calibrated in millimetres of depth, equipped with a probe of diameter 3 mm.

4.7 Breakage-defect sizer(s), with a slot uncovering 2 mm on both surfaces, for determination of minimum defect sizes for corner and edge defects, according to figure 5. A breakage-defect sizer shall be used, together with a steel straightedge (4.3), for the measurement of corner defects (see clause 6). Two breakage-defect sizers shall be used together with a linear measuring device according to 4.2 for the measurement of edge defects (see clause 7).

NOTE 3 A breakage-defect sizer permits an objective definition of the point of departure for the measurement of the size of a broken edge.

5 Preparation of bricks for measurement

The definition of edges and surfaces of bricks shall be improved, when necessary, by removing any projections such as fins, blisters or parting sand. This can be achieved by light abrasion.

Discolourations, such as those caused by iron oxide, shall be checked to see that they do not indicate the presence of hidden craters. To test for possible craters in such cases, the discoloured area shall be lightly tapped two or three times with the flat face of a 100 g steel-headed hammer. Any craters revealed by this process shall be measured and reported according to clause 8.

NOTE 4 This surface improvement should not be carried out if surface protrusions are to be measured as described in clause 10.

6 Measurement of corner defects

Measure the dimensions a, b and c of corner defects (see figure 1) using a steel straightedge (4.3), a breakage-defect sizer (4.7) and a steel tape (4.2) as indicated in figure 6. The breakage-defect sizer is positioned along the edge to be measured in such a way that the leading edge of the slot coincides with the broken corner on at least one surface of the brick, as shown in figure 7. The dimensions a, b and c (see figure 1) are measured between the steel straightedge and the leading edge of the breakage-defect sizer, to the nearest millimetre.

7 Measurement of edge defects

Measure the length g of an edge defect (see figure 2) using two breakage-defect sizers (4.7) and a steel tape (4.2), as indicated in figure 8. Measure the depth of the edge defect as defined by e and f (see figure 2) using a steel straightedge (4.3) and a steel tape. Measure all dimensions to the nearest millimetre.

8 Measurement of craters

Measure the maximum diameter (D) and minimum diameter (d) of a crater using a steel tape (4.2) as indicated in figure 9. The apparent crater diameter is given by the formula:

$$\frac{D+d}{2}$$

Measure the depth (h) of a crater using a depth gauge (4.6) as indicated in figure 9.

Measure all dimensions to the nearest millimetre.

9 Measurement of cracks

Measure the length of a crack with a steel tape (4.2) in one or more straight lines. If the crack continues on more than one surface, the crack length is equal to the sum of the crack lengths on each surface.

Measure the width of a crack either with a graticule (4.2) or with feeler gauges (4.5).

Measure any area of surface crazing (3.4.2) in square centimetres.

Measure the dimensions of cracks to the accuracy given in table 1.

Table 1 — Accuracy of measurement

Dimensions in millimetres

Measurement		Accuracy to the nearest
Length of crack		1
Width of open crack	> 0,2 ≤ 1	0,2
	> 1	0,5

10 Measurement of protrusions and indentations

Measure the height of a protrusion from the surface of the brick by means of a straightedge (4.3) and measuring wedges (4.4), to the nearest 0,5 mm. Place the straightedge parallel to the surface and in contact with the protrusion and adjust the measuring wedges so that equal readings are obtained on each of them, as indicated in figure 10.

Measure the depth of indentations, to the nearest millimetre, by the same method as used for craters (see clause 8).

11 Measurement of fins

Measure the height of fins, to the nearest millimetre, by the same method as used for protrusions (clause 10), or with the depth gauge (4.6) or steel tape (4.2).

12 Test report

The test report shall include the following information:

a) the name of the testing establishment;

b) the place and date of the test;

c) a reference to this part of ISO 12678, i.e. "Determination of defects and imperfections, in accordance with ISO 12678-2";

d) the designation of the material tested (manufacturer, size and shape, quality);

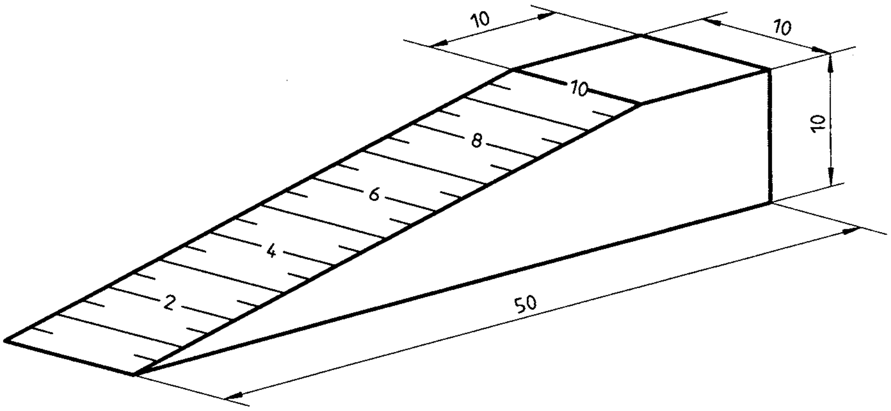
e) batch size and sample size (number of items);

f) inspected properties;

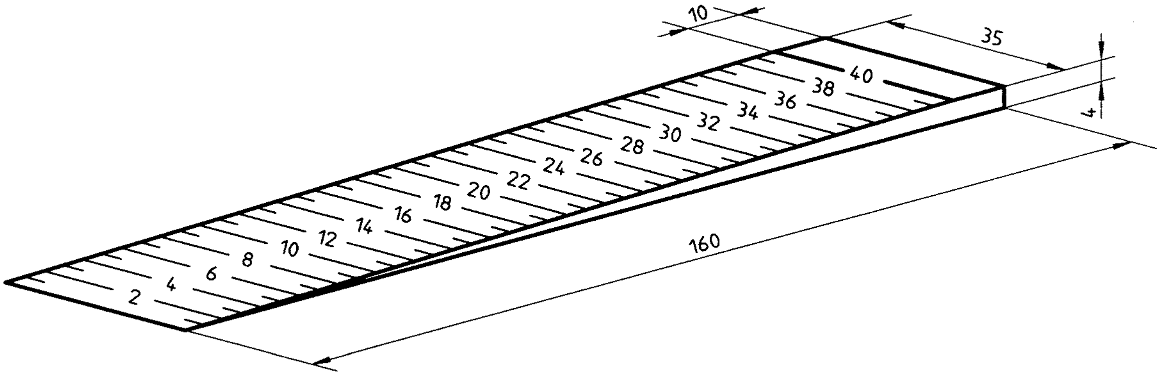
g) results of the inspection;

h) name and signature of the inspector.

Dimensions in millimetres



a) Type 1



b) Type 2

Figure 4 — Two types of measuring wedge

Dimensions in millimetres

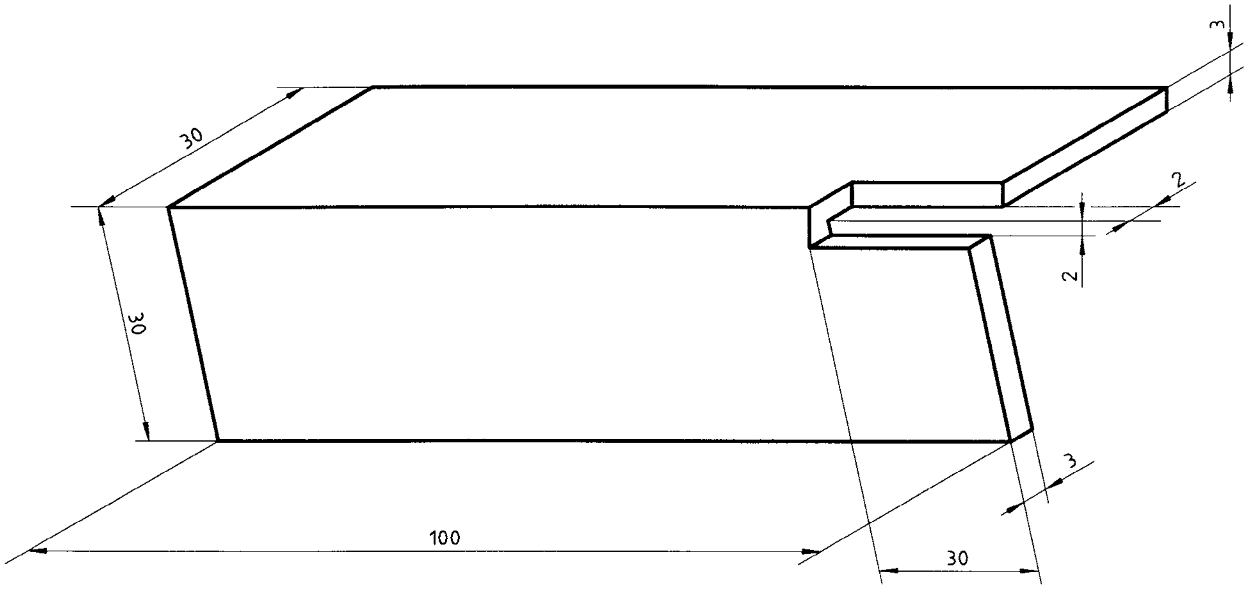


Figure 5 — Breakage-defect sizer

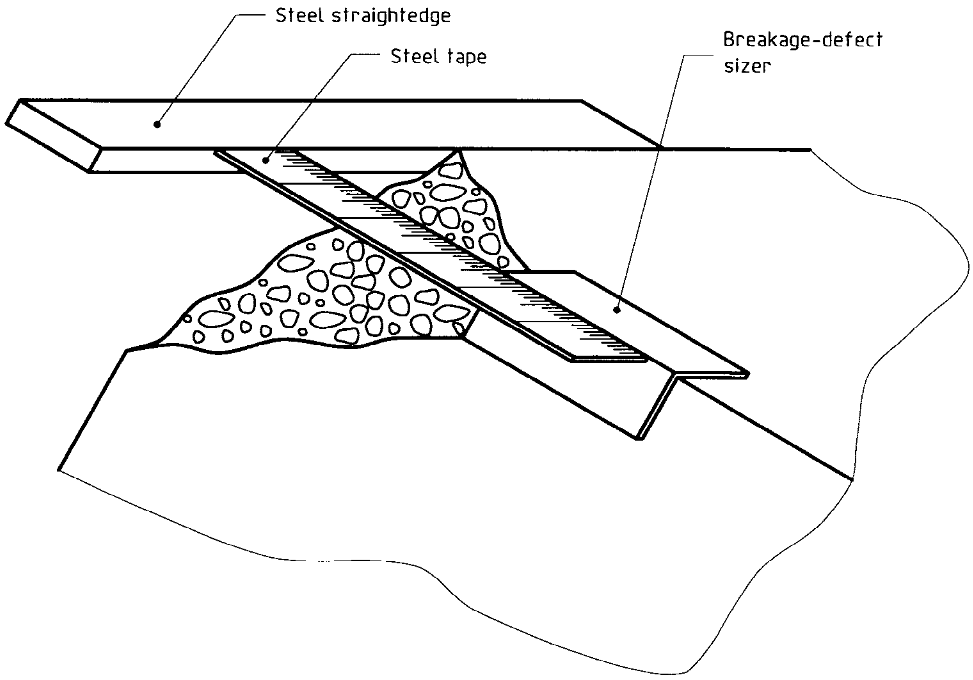


Figure 6 — Measurement of a corner defect

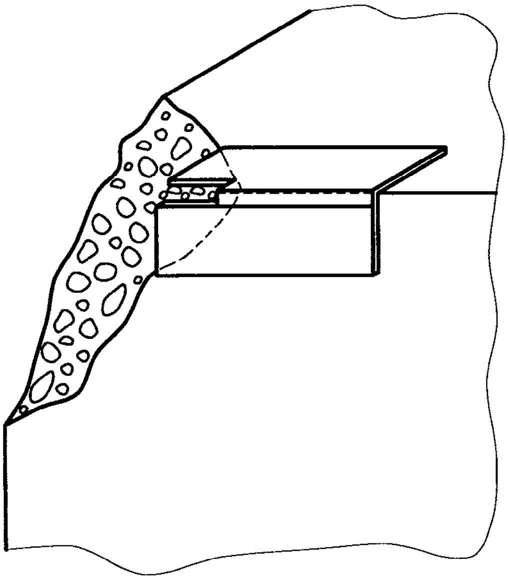


Figure 7 — Positioning the breakage-defect sizer

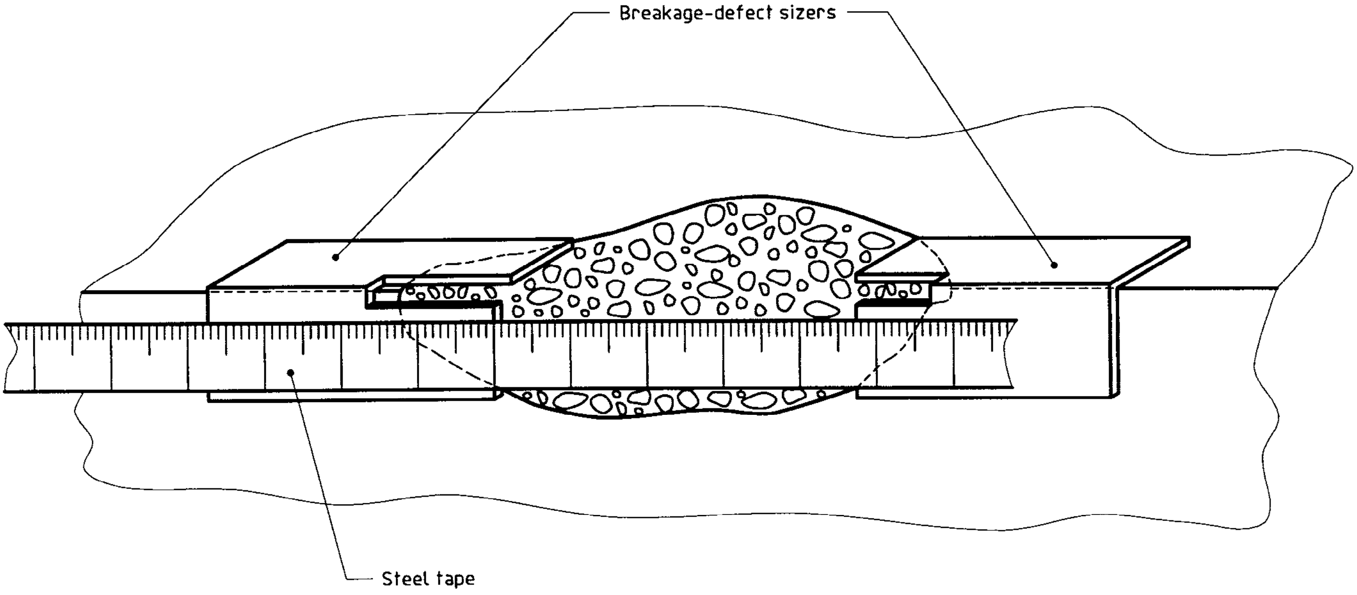


Figure 8 — Measurement of the length of an edge defect

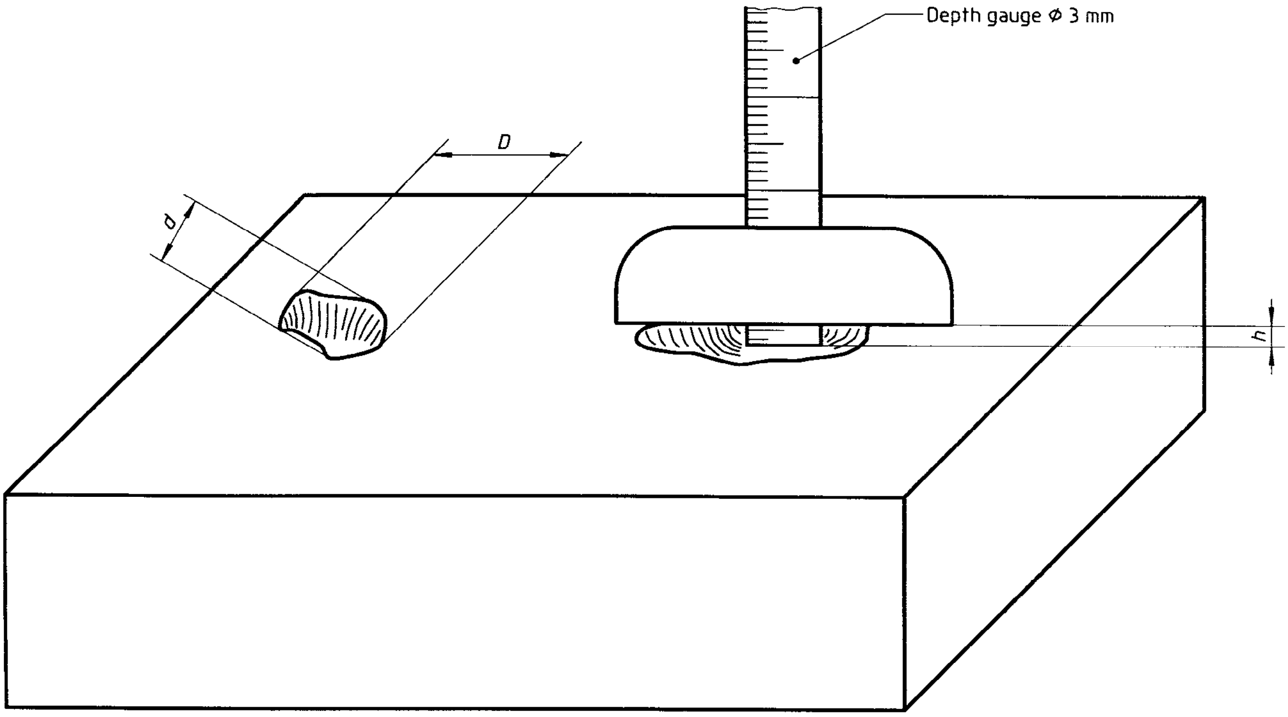


Figure 9 — Measurement of craters

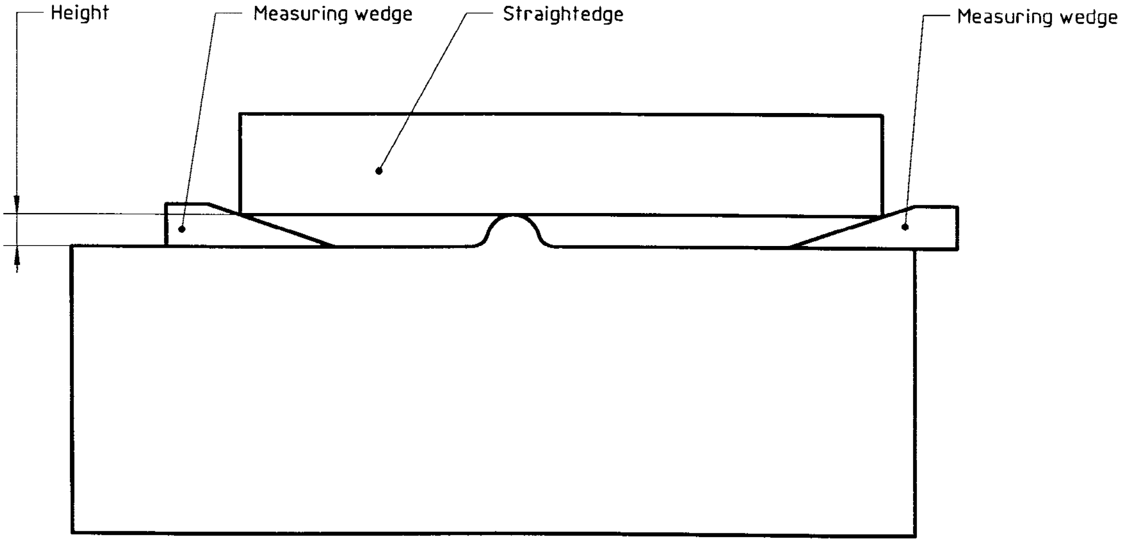


Figure 10 — Measurement of the height of a protrusion

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